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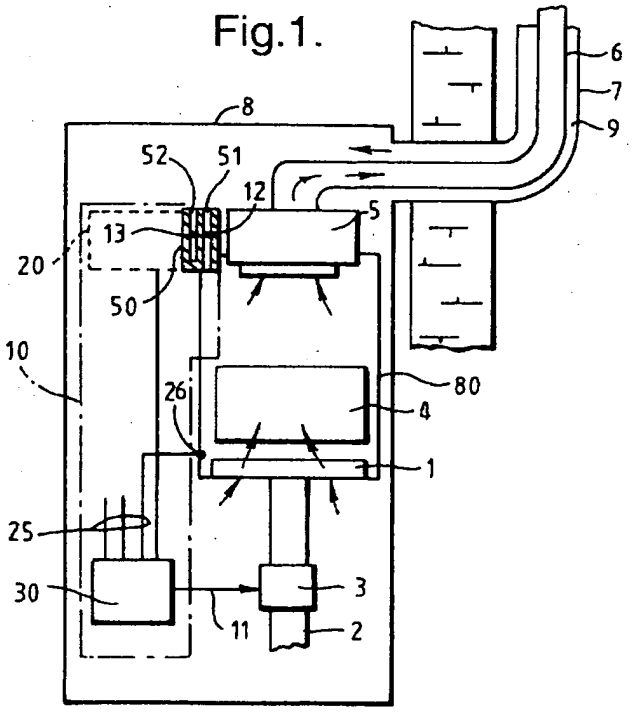
(54) Gas appliances and control systems

(57) A gas boiler has a thermistor 12 located in a passage 51 opening into an inner enclosure 80 containing the burner 1, heat exchanger 4 and the inlet of an induced draught blower 5. Reduced pressure in the enclosure 80 generated by the blower 5 draws air along the passage 51 over the thermistor 12. A comparator 17 receives the output of the thermistor 12 and that of a second thermistor 13 protected from air flow. The output of the comparator 17, together with outputs from other safety sensors 26, is connected with a logic unit 30, which controls operation of the burner gas supply valve 3. If there is a blockage, blower failure or the like, air flow over the thermistor 12 drops causing a change in output of the comparator 17, which causes the logic unit 30 to shut off the gas supply valve 3.

Fig.1.



EP 1 122 498 A2

Description

[0001] This invention relates to gas appliances of the kind including a gas burner, a blower for causing flow of air and combustion products in the appliance and a detector for detecting inadequate flow through the appliance.

[0002] Gas appliances, such as gas boilers, include various safety features and often have some means for ensuring that gas supply does not continue if air supply to the appliance is inadequate for correct combustion. In gas boilers, where a blower is used to deliver air to the burner, a pressure sensor detects the pressure at the blower outlet. In this way, any failure of the blower or blockage to flow of air or combustion products can be detected. The problem with this previous arrangement is that the pressure sensors are relatively expensive, especially those needed to detect low air pressures. They can also be unreliable leading to unsatisfactory combustion or unnecessary boiler shut-down. Furthermore, multiple pressure sensors are needed in boilers having an output that can be modulated.

[0003] It is an object of the present invention to provide an alternative gas appliance and control system for a gas appliance.

[0004] According to the present invention there is provided a gas appliance of the above-specified kind, characterised in that the detector includes a thermal sensor responsive to flow caused by the blower.

[0005] The thermal sensor preferably includes a temperature-dependent electrical device, such as resistor or thermistor. Preferably, the appliance includes two temperature-dependent electrical devices, the first of which is exposed to flow caused by the blower and the second of which is protected from such flow such that operation of the blower causes different changes in the first and second devices. The appliance is preferably a boiler having a heat exchanger located in an enclosure between the burner and the inlet of the blower, the thermal sensor being responsive to gas flow along a passage opening into the enclosure. The enclosure is preferably contained within an outer housing, the outlet of the blower opening to an exhaust passage of a balanced flue and an inlet passage of the balanced flue opening into the housing outside the enclosure.

[0006] A gas boiler appliance including a control system according to the present invention, will now be described, by way of example, with reference to the accompanying drawing, in which:

Figure 1 shows the boiler schematically; and

Figure 2 shows the control system in greater detail.

[0007] With reference first to Figure 1 there is shown a gas boiler including a burner 1 connected to a gas supply pipe 2 via a gas valve 3. A heat exchanger 4 mounted above the burner 1 transfers heat produced by the burner to water or ventilation air. The boiler also includes an induced draught blower 5 having its inlet located above the heat exchanger 4 and its outlet coupled to the central, exhaust passage 6 along a balanced flue 7. The casing 8 of the boiler is sealed and opens into the outer, inlet passage 9 of the flue 7 so that, when the blower 5 operates it extracts combustion products from the boiler to the exhaust passage 6 of the flue and induces a draught of air along the outer, inlet passage of the flue to the burner 1 in order to enable combustion. An inner enclosure 80 extends between the burner 1, heat exchanger 4 and blower 5 to control flow of air and combustion products from the burner to the blower inlet. As so far described, the boiler is conventional.

[0008] The boiler also includes a control system 10 having an output on line 11 to the gas valve 3, to control its operation. The control system 10 is shown in greater detail in Figure 2 and comprises a flow-sensing detector unit 20 and a boiler logic unit 30. The flow-sensing unit 20 includes two negative temperature coefficient thermistors 12 and 13, or other temperature-responsive resistors, connected in series across a voltage source 14. A series of two further fixed resistors 15 and 16 is also connected across the voltage source 14, in parallel with the two thermistors 12 and 13. The sensing unit 20 includes a comparator 17 having one input 18 connected to the junction 19 between the two thermistors 12 and 13 and its other input 21 connected to the junction 22 between the two fixed resistors 15 and 16. The output 23 of the comparator 17 is connected to one input of the logic unit 30 and is also connected with the positive terminal of the voltage source 14 via a further resistor 24. The logic unit 30 has several further inputs 25 from other conventional safety sensors, such as a spark sensor 26 and provides the output on line 11 to open the gas valve 3 when all its inputs indicate that it is appropriate to supply gas to the burner 1.

[0009] The two thermistors 12 and 13 are mounted adjacent to one another in a block 50 of metal or plastics located in an opening of the inner enclosure 80 adjacent the blower 5. One thermistor 12 is located in a channel 51 that opens at opposite ends of the block 50 so that one end is at the blower inlet pressure and the opposite end is at the (higher) ambient pressure within the casing 8, which is the pressure at the air inlet of the burner 1. There is, therefore, a pressure differential along the channel 51 causing air to flow down along the channel, over the thermistor 12. The other thermistor 13 is located in a second channel 52 through the block 50, which is blocked so that it is not exposed to any air flow.

[0010] When the blower 5 is operating and there is no impediment to the flow of air or combustion products through the boiler, air will flow through the channel 51 over the first thermistor 12 in the channel 51 but not over the second thermistor 13 in the blocked channel 52. Since both thermistors 12 and 13 are heated by the current passing through them, the gas flow over the exposed thermistor 12 will increase the rate of dissipation

of heat from it but will have no effect on the other thermistor 13. The temperature of the exposed thermistor 12 will, therefore, fall below that of the other thermistor 13 and its resistance will increase, causing the voltage at junction 19 to fall. If flow is sufficient, this voltage is low enough to cause the comparator 17 to produce and output to an input to the logic unit 30 enabling it to hold open the gas valve 3, providing its other inputs are also appropriate.

[0011] If the blower 5 does not operate or if there is some restriction to flow through the exhaust 6 or inlet passage 9 of the flue 7, the flow over the exposed thermistor 12 will fall and its temperature will rise closer to that of the concealed thermistor 13. The voltage at the junction 19 between the thermistors will, therefore, rise to approximately half that across the series pair of the two thermistors. The comparator 17 is arranged so that its output causes the logic unit 30 to maintain the gas valve 3 off in such a condition.

[0012] The present invention provides effective monitoring in a gas appliance of both air flow to a burner and the flow of combustion products from a burner without the need for a pressure sensor. It will be appreciated that the invention is not confined to gas boilers but could be used in other gas appliances. Other thermal means responsive to air flow could be used instead of thermistors.

Claims

1. A gas appliance including a gas burner (1), a blower (5) for causing flow of air and combustion products in the appliance and a detector (20) for detecting inadequate flow through the appliance, characterised in that the detector (20) includes a thermal sensor (12, 13) responsive to flow caused by the blower (5).

2. A gas appliance according to Claim 1, characterised in that the thermal sensor includes a temperature-dependent electrical device (12, 13).

3. A gas appliance according to Claim 2, characterised in that the electrical device is a resistor or thermistor (12, 13).

4. A gas appliance according to Claim 2 or 3, characterised in that the appliance includes two temperature-dependent electrical devices (12 and 13), the first of which (12) is exposed to flow caused by the blower (5) and the second of which (13) is protected from such flow such that operation of the blower (5) causes different changes in the first and second devices (12 and 13).

5. A gas appliance according to any one of the preceding claims, characterised in that the appliance is a boiler having a heat exchanger (4) located in an enclosure (80) between the burner (1) and the inlet of the blower (5), and that the thermal sensor (12, 13) is responsive to gas flow along a passage (51) opening into the enclosure (80).

6. A gas appliance according to Claim 5, characterised in that the enclosure (80) is contained within an outer housing (8), that the outlet of the blower (5) opens to an exhaust passage (6) of a balanced flue (7), and that an inlet passage (9) of the balanced flue (7) opens into the housing (8) outside the enclosure (80).

Fig.1.

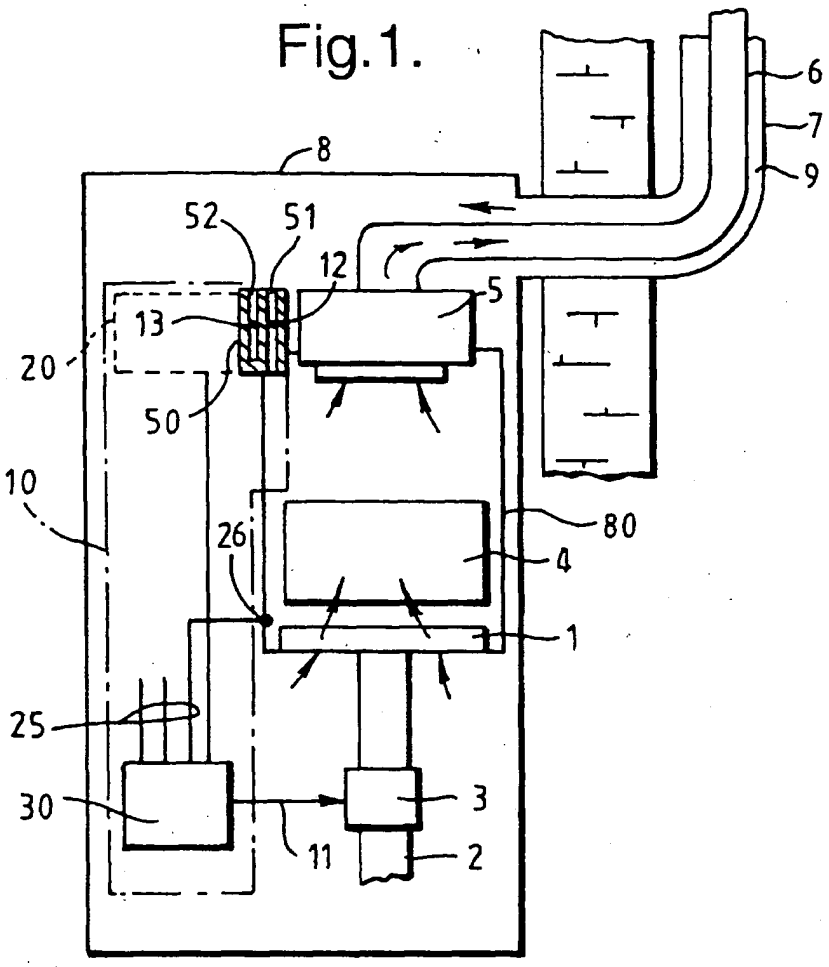

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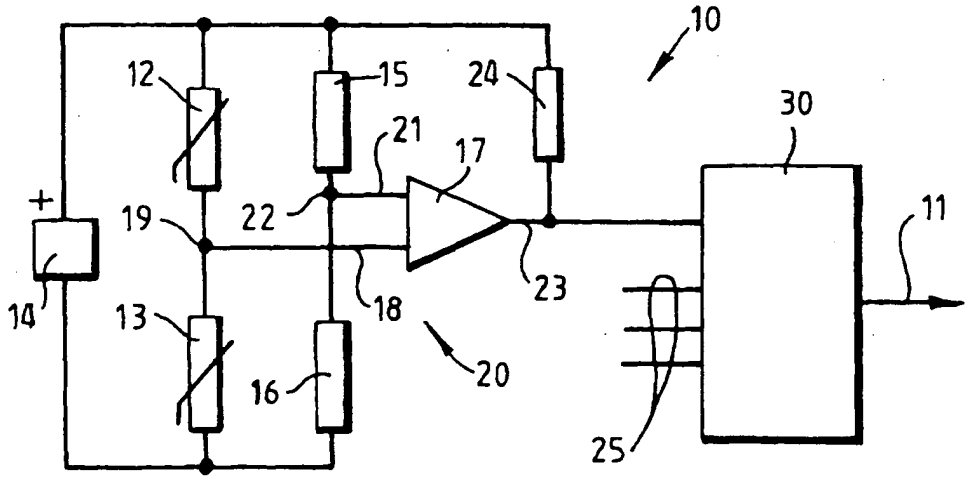
Fig.2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